

unnecessary to give here, as they will be accessible to most readers who interest themselves on the subject of binary stars. For the interval 1864-76, in which Mr. Hall states he had not measures in his possession, the following may be cited:—

Powell 1870.10	Position 20.45	Distance 10.24
Russell 1870.75	„ 22.3	„ 10.46
— 1872.47	„ 25.5	„ 9.74
Ellery 1874.15	„ 30.5	„ 8.00
Russell 1874.47	„ 30.0	„ 7.97

On the question of the brightness of the components Sir John Herschel says:—“Individually their magnitudes have been very differently estimated by other observers from what I consider to be their correct values. All agree in assigning the first magnitude to the principal star, or that which follows in R.A. (1834-37); but whereas Lacaille, and after him Fallows, Johnson, Taylor, and Messrs. Dunlop and Rumker estimate the preceding star of the fourth magnitude, I have never estimated its magnitude as seen with the equatorial lower than 2.3, and the mean of all the magnitudes assigned to it with this instrument is 1.73, or $1\frac{3}{4}$ by a mean of eleven observations. . . . On the whole evidence afforded by my experience I am disposed to assign to it a magnitude which may be deemed indifferently either a very low first or a very high second.” Sir John Herschel further considered that “it is not necessary to recur to the hypothesis of variability to account for this difference of estimation,” and gave his reasons for this opinion (“Cape Observations,” p. 300).

BIOLOGICAL NOTES

DECORATIVE COLOURING IN FRESHWATER FLEAS.

—There is something essentially comic in the notion of a freshwater flea—a species of the entomostracous crustaceous Daphnoidæ—becoming beautifully ornamented with patches of scarlet and blue, for the purpose of seducing the affections of the opposite sex. If a scarlet coat is appreciated by the females of the very fleas of this great family to which we all belong, we ought not to be surprised at hereditary predispositions in favour of this colour, and should conclude on this ground, as on many others, that the civilian male Anthropini of western Europe have taken a foolish and unnatural step, within the last hundred years, in abandoning the use of brilliantly-coloured clothing, and giving over the exceptional advantages which it confers to soldiers and huntsmen. The figures given by Prof. August Weismann, in the *Zeitschr. wiss. Zoologie* (1878, Supplement 1), show us the water-fleas, *Polypheumus* and *Latona*, most gorgeously got up in blue and scarlet. Goethe, though he never saw them, foretold their appearance:—

“Es war einmal ein König, der hatt' einen grossen Floh,
Den lieb' er gar nicht wenig, als wie seinen eignen Sohn,

In Sammet und in Seide, war er nun angethan,
Hatte Bänder auf den Kleide, hatt' auch ein Kreuz daran,”
&c., &c.

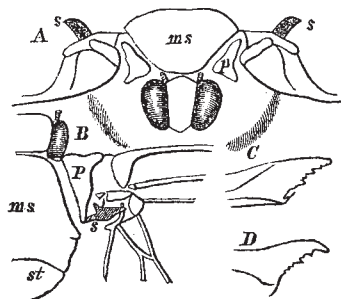
It is to the elaborate and ingenious studies of Prof. Weismann on caterpillars—worthy to be placed by the side of the most original of Mr. Darwin's own investigations—that we owe our knowledge of an exceedingly important cause of animal coloration, namely, that which is explained by the term “startling” or “terrifying” colouration (Schreckfarben). Just as in various human races the amorous of both sexes paint their faces and adorn their bodies in order to attract one another, so nature paints by sexual selection, and just as we dress ourselves up in wigs and gowns and spectacles, or tattoo our countenances in order to terrify evil-doers so (Prof. Weismann shows) does nature paint masks with staring eyes upon the feeble caterpillar's back in order that he may enjoy the privileges so usually gained by the ass in the

lion's skin. Brilliant patches of colour occur only in a few Daphnoidæ (also in a few Phyllopoda), and after a very detailed investigation as to the variations which these patches of colour present in the different species, in the two sexes, and at different seasons and at different periods of growth, Prof. Weismann comes to the conclusion that they must be regarded as a decoration acquired by sexual selection which probably was first of all confined to the male sex, but subsequently, in most cases, became transmitted also to the other sex. Probably a reciprocal and alternating sexual selection favoured this transference to the female sex, the most brilliant females being chosen by the few males existing at the commencement of a sexual period, and the most brilliant males being chosen by the relatively few females existing at the end of such a period. The existence of these “sexual periods” is a well established feature in the life-history of Entomostraca, alternating with parthenogenetic periods. From the fact that neighbouring colonies of the same species have a constantly differing arrangement of colour, it appears probable that the development of these decorative colour-patches took place after the isolation of the colonies, that is to say subsequently to the glacial period in northern Europe. The transference of the decorative coloration originally developed only by the males, took place in three directions—firstly to the other sex; secondly to the not-yet sexually mature period of growth; and thirdly to the parthenogenetically produced generations. In the various species of Daphnoidæ with decorative coloration we find different degrees of completeness of the transference in these three different directions. Only one species, viz., *Latona*, presents the highest degree or complete transference of the coloration to both sexes, all stages of growth and all generations of the annual cycle. Prof. Weismann concludes that the Daphnoidæ afford a further case in favour of the hypothesis that secondary sexual characters can be converted into general characteristics of the species, and that they confirm Mr. Darwin's theory of the origin of the colour-patterns of butterflies' wings.

HOW LEPIDOPTERA ESCAPE FROM THEIR COCOONS.—

The mode in which butterflies and moths free themselves from their chrysalides has been a subject of some controversy, but of very little recent observation. With regard to the silkworm moth, Malpighi asserted that the animal first wets the silk with a liquid calculated to dissolve the gum that connects the threads, and then employs its lengthened head to push them aside and make an opening. Réaumur, however, maintained that the threads of silk are not merely pushed aside, but are actually severed, and believed that the eyes, which are the only hard organs of the head, are the instruments by which the threads are divided, their numerous minute facets serving the purpose of a fine file. That the threads are actually cut is the general view; and the account of the breeding of silkworms, published in the *American Philosophical Transactions*, states that cocoons, out of which the moth has escaped, cannot be wound. On the other hand it is known to be a common practice with many moths the chrysalis of which is very hard, to discharge, immediately before issuing forth, a copious fluid from the mouth by which the shell is so softened that they are able to force their way through it. In an article in the *American Naturalist* for June, Dr. A. S. Packard, after reviewing our previous knowledge of the subject, gives an account of some interesting observations of his own. His attention being arrested by a rustling, cutting, and tearing sound, issuing from a cocoon of the large green swallow-tail silkworm moth, *Actias luna*, he discovered, on examination, a sharp black point moving to and fro, and then another, until both points had cut a rough irregular slit, through which the shoulders of the moth could be seen vigorously moving from side to side. The hole or slit was made in one or two minutes, and the

moth worked its way at once out of the slit. The wings at this time being very small and flabby, and the shoulders being alternately much raised, the points stuck up far enough to cut or saw through the cocoon. The wings were at first of a deep buff yellow, but in half an hour after they began to expand and to turn green. The black points can be detected when the wings are fully expanded, not being entirely covered by the hairs at the base of the wing. In this case no fluid was seen to exude from the mouth, and the cocoon was perfectly dry. The black points are seen, when magnified, to have the form of a rude saw, and Dr. Packard proposes for them the term *sectores coconis*. The cocoon-cutters were found in every other species of the sub-family *Attaci* that was examined; in *Telea polyphemus* they are large and well-developed; they are rather small in *Callosamia promethea*, *Platysamia cecropia*, *P. Gloverii*, *Samia cynthia*, an *Attacus* from Nicaragua, and *Attacus amazonia*, Pack., from Pebas,



Peru; large and well-marked in the European *Saturnia pavonia-minor* and *Endromis versicolora*. In *Bombyx mori* the spines are not well-marked, and they are quite different from those of the *Attaci*. They are three sharp points, being acute angles of the pieces at the base of the wing. No such spines are present in *Eacles imperialis*.

In the accompanying cut A represents a front view of a specimen of *Actias luna* which came out of the cocoon and died with the wings not expanded; the shoulders are elevated, and the rudimentary wings hanging down; *ms* the scutum, *s* the cocoon-cutter, *p* the patagium. B represents another specimen with fully-developed wings; *ms* the scutum, *st* the scabellum of the meso-thoracic segment, *s* the cocoon-cutter, which is evidently a modification of one of the pieces at the base of the fore-wings; it is surrounded by membrane, allowing free movement. C and D are modifications of the spine or *sector coconis* considerably magnified, showing the five or six irregular teeth on the cutting edge, the spine being sharp, curved, and conical. It will be seen that it acts like a rude saw.

FEAR OF SNAKES IN PRIMATES.—Mr. A. E. Brown has recently made experiments in the Philadelphia Zoological Garden, in pursuance of those of Mr. Darwin. He coiled a dead snake in a newspaper, so as to be easily capable of coming loose, and set it on the floor of a cage containing a great variety of monkeys. It was instantly carried off by a leading spirit, but in a few seconds the paper became unfolded and the snake was exposed. The monkey instantly dropped it and went away, but with a constant look behind. The other monkeys, perceiving the snake, approached, step by step, and formed a circle round it six or eight feet in diameter. None approached except one Macaque, who cautiously made some snatches at the paper. At this moment a string which had been attached to the snake's tail was gently pulled; the snake moved, consequently, and the monkeys fled precipitately, with great chattering and screaming. Some time after they gradually returned to their former position, and they continued for some hours showing both intolerable fear and a strange attraction. The same monkeys had no fear of a tortoise or a small

dead alligator. The same snake was then shown to mammals of other orders, but none of them showed any especial interest. It is seen that the same dread of snakes is shared by the human species, especially women. Mr. Brown was able to trace, in the actions of a woman who was deaf and dumb, very similar fear, attraction, and repulsion to that shown by the monkeys. Is this a relic of early struggles for existence with an enemy whose bite produced results very different from that of other animals, and exposed mankind to a death lingering and horrible?

THE FERTILISATION OF EGGS OF THE LAMPREY.—We have frequently referred to the great progress of researches into the actual phenomena of fertilisation, especially those of Hertwig. Ernst Calberla, of Freiburg, is another most earnest pursuer of this subject, and he has followed the fertilisation of the lamprey. His views corroborate very strongly those of Hertwig, with some additional particulars. He finds a very distinct external micropyle, with a channel in the yolk leading into the ovinucleus (*Eikern*), which is the residuum of the germinal vesicle. The spermatozoon which is so fortunate as to find the micropyle, enters it and gives rise to the sperm-nucleus (*Spermakern*), which appears twenty-six seconds after the entrance of the spermatozoon into the micropyle. In a minute and a half altogether, the cleavage-nucleus (*Furchungskern*) is seen. After five hours the first cleavage furrow arises, at the spot where the micropyle was situated. In the *Zeitschrift für wissenschaftliche Zoologie*, vol. xxx. part 3, Calberla gives a most interesting account of his procedure and observations, and reviews the work of other investigators, giving a capital bibliography which is of value to those interested in such a rapidly expanding subject.

GEOGRAPHICAL NOTES

ADMIRAL SIR GEORGE BACK, F.R.S., died on Sunday at the age of eighty-one years. He entered the Royal Navy when twelve years old as a midshipman on board the *Arethusa*, and in 1818 joined a vessel under the command of Sir John Franklin, whom he accompanied on his expedition overland from Hudson's Bay to the Coppermine River, having already taken part under Capt. Buchan in his perilous voyage of discovery made to the neighbourhood of Spitzbergen. In the spring of 1825 Lieut. Back again accompanied Sir John Franklin on his second expedition to the Arctic regions for the purpose of co-operating with Capt. Beechy and Capt. Parry in their simultaneous efforts to ascertain from opposite quarters the existence of a north-west passage. Full details of this voyage will be found in Franklin's "Narrative of a Second Expedition to the Shores of the Polar Sea." Back was again appointed in the spring of 1833 to conduct the expedition fitted out for the purpose of seeking and relieving Sir John Ross, who had gone out nearly four years previously in quest of the north-west passage. A full account of the results of that hazardous enterprise, in the course of which he discovered the river which has since borne his name, Capt. Back gave to the world in his "Narrative of the Arctic Land Expedition to the Mouth of the Great Fish River and along the Shores of the Arctic Ocean in 1833-35." In 1836 Capt. Back sailed in command of another expedition to the frigid zone. The details of this expedition, in the course of which he reached Frozen Strait, almost within sight of Repulse Bay, were published by Capt. Back in his "Narrative of the Expedition in Her Majesty's Ship *Terror*, Undertaken with a view to Geographical Discovery, in 1836-37." In 1857 he obtained flag rank, but had not been afloat since that date. In 1837 Back had awarded to him the gold and silver medals of the Geographical Society. He also was honoured by the gold